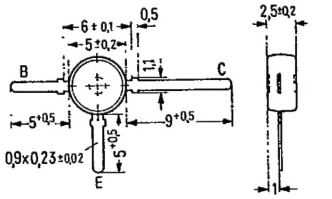
NPN Silicon RF Broadband Transistor

BFT 12

SIEMENS AKTIENGESELLSCHAF D

BFT 12 is an epitaxial NPN silicon planar RF transistor in a plastic package similar to TO 119 (50 B 3 DIN 41 867), intended for universal application in amplifiers up to the GHz range, e. g. for broadband antenna amplifiers with a high output power and linearity and for oscillators.

Type	Ordering code
BFT 12	Q62702-F390



Approx. weight 0.3 g Dimensions in mm

Maximum ratings

Collector-base-voltage	V_{CBO}	25	V
Collector-emitter voltage	V_{CEO}	15	V
Emitter-base voltage	V_{EBO}	3.5	V
Collector current	I_C	150	mA
Collector peak current ($f > 1$ MHz)	I_{CM}	300	mA
Base current	I_B	50	mA
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	–55 to +125	°C
Total power dissipation (T_{amb} = 66°C)	P_{tot}	700	mW

Thermal resistance

Juncition to ambient air[1)]	R_{thJA}	≦120	K/W
Junction to case	R_{thJC}	≦90	K/W

1) when mounted on glass fiber epoxy resin PCB 40 mm x 25 mm x 1 mm

Static characteristics (T_{amb} = 25°C)			
Collector-base breakdown voltage (I_{CBO} = 100 µA)	$V_{(BR)CBO}$	>25	V
DC current gain (I_C = 50 mA; V_{CE} = 5 V)	h_{FE}	≧25	–
Dynamic characteristics (T_{amb} = 25°C)			
Transition frequency (I_C = 80 mA; V_{CE} = 5 V; f = 200 MHz)	f_T	1.9	GHz
Reverse transfer capacitance (I_C = 5 mA; V_{CE} = 10 V; f = 1 MHz)	C_{12e}	2.4	pF
Collector-base capacitance (V_{CBO} = 10 V; f = 1 MHz)	C_{CBO}	3	pF
Power gain (I_C = 40 mA; V_{CE} = 7.5 V; f = 800 MHz; R_g = 60 Ω)	G_{pe}	7.5	dB
(I_C = 80 mA; V_{CE} = 7.5 V; f = 800 MHz; R_g = 60 Ω)	G_{pe}	8	dB
Noise figure (R_g = 60 Ω; I_C = 40 mA; V_{CE} = 7.5 V; f = 800 MHz)	NF	6.5	dB
Output voltage[1] (I_C = 80 mA; V_{CE} = 7.5 V; f = 800 MHz; d_{IM} = 60 dB, R_g = R_L = 75 Ω)	V_0	1000	mV

S parameter at V_{CE} = 7.5 V; I_C = 60 mA; Z_o = 50 Ω

f (GHz)	S_{11e}	φ	S_{21e}	φ	S_{12e}	φ	S_{22e}	φ
0,1	0,691	–170	14,199	94	0,022	55	0,208	–115
0,2	0,701	–177	7,261	85	0,038	68	0,160	–135
0,3	0,717	177	4,860	78	0,053	70	0,151	–147
0,4	0,722	175	3,666	73	0,069	71	0,159	–148
0,5	0,715	173	2,909	67	0,083	72	0,168	–149
0,6	0,726	169	2,458	63	0,101	73	0,179	–148
0,7	0,738	167	2,102	59	0,115	72	0,192	–149
0,8	0,736	165	1,823	53	0,130	72	0,214	–149
0,9	0,740	163	1,619	49	0,146	71	0,240	–147
1	0,752	161	1,458	44	0,159	70	0,244	–148

1) three tone modulation f approx. 800 MHz

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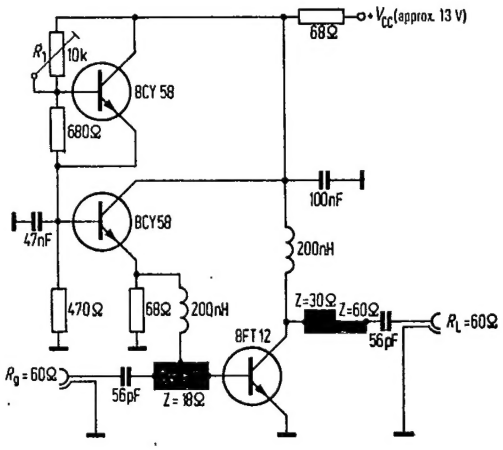
Circuit example: Broadband RF amplifier



Operating point (set with R_1):
I_C = 80 mA; V_{CE} = 7.5 V.

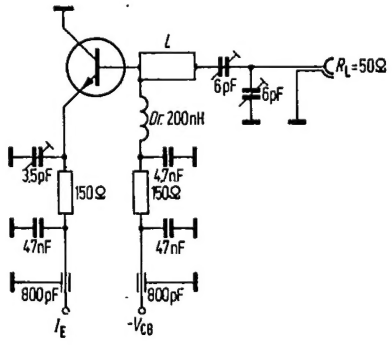
At f = 800 MHz and an intermodulation product distance of d_{IM} = 60 dB[1], the following values are obtained:

Output voltage V_o = 700 mV
Power gain G_p = 8 dB
(refer to curve $G_p = f(f)$)

1) Two-tone modulation f_1 = 800 MHz; f_2 = 804 MHz.

Oscillator diagram

f = 1 GHz; L = 15 mm strip-line
Z_o = 50 Ω



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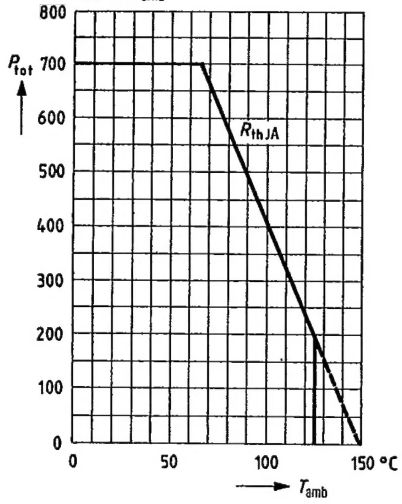
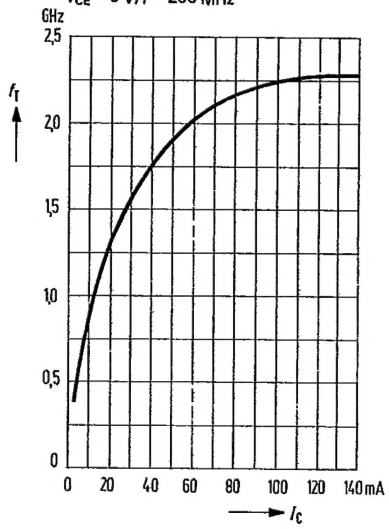
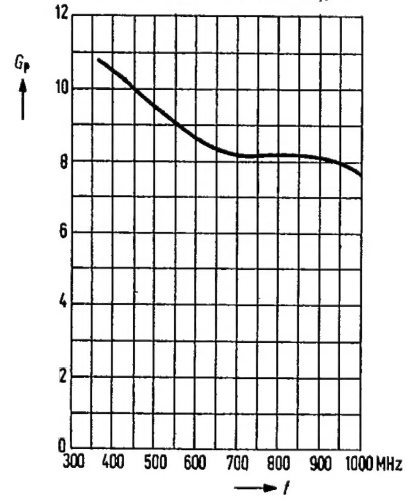
Total perm. power dissipation versus temperature
$P_{tot} = f(T_{amb})$



Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V; f = 200 MHz



Power gain $G_p = f(f)$
I_C = 80 mA; V_{CE} = 7,5 V
dB TV band IV-V (refer to circuit example)



Oscillator output power
$P_{osc} = f(V_{CB})$; I_C = 75 mA; f = 1 GHz